CBMANET
Thoughts on a Physical Layer

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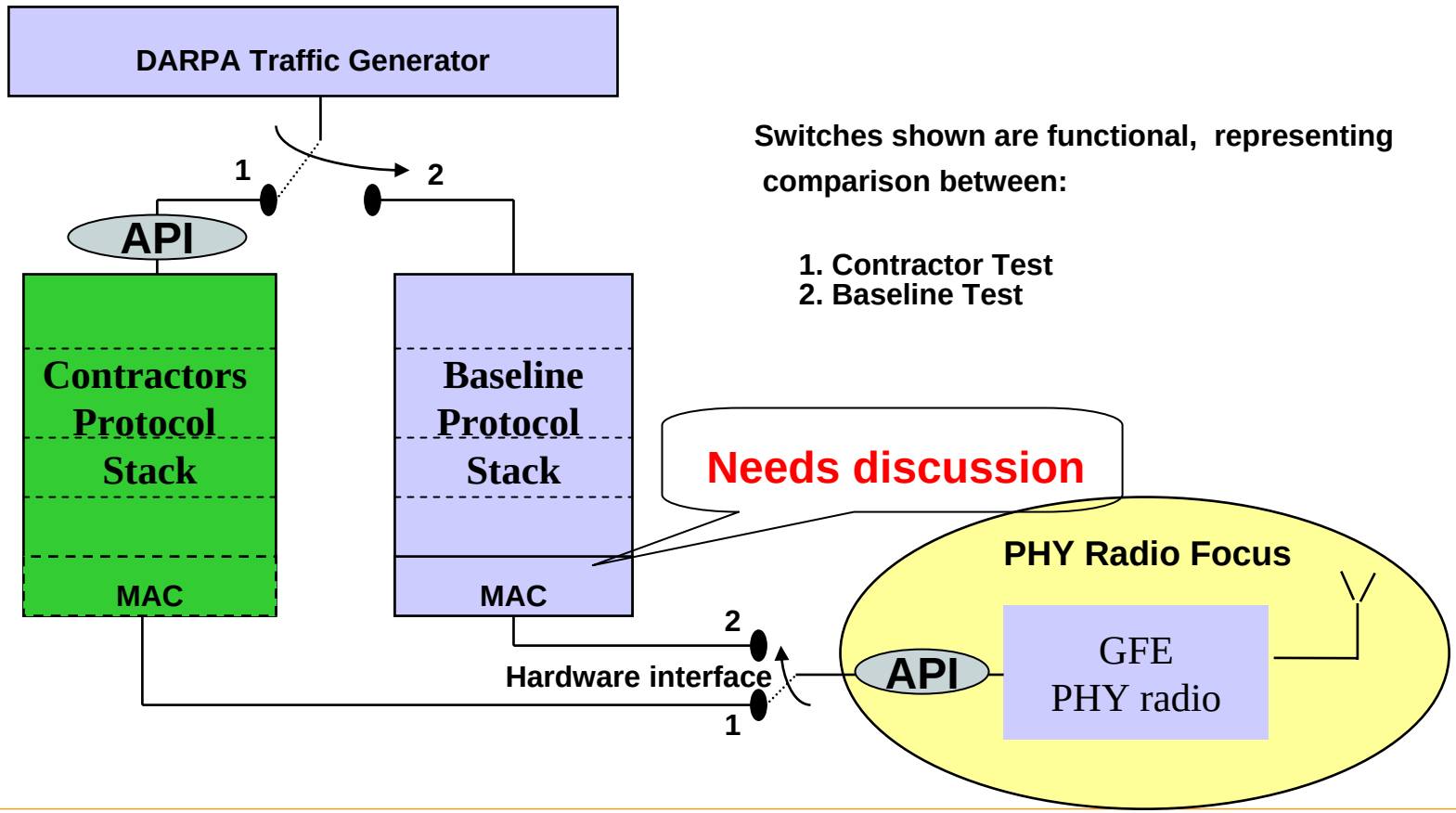
GFE PHY Characteristics (ref. BAA)

- The PHY should minimally constrain CBMANET innovation insofar as it does not force a particular approach to the remaining network layers (e.g. it should have separable media access functionality)
- It should provide a rich interface to enable the cross-layer interactions that touch on the PHY
- It must permit flexible bandwidth allocation in order to support the CBMANET test and evaluation methodology
- It should be available for use by all performers without restriction

Desired CBMANET Test Capability

- Select a GFE PHY radio for DARPA providing RF, IF, and hardware to run the PHY processing layer
- Document hardware interface and software API supporting interface to contractors' software radio/protocol stack(s):



GFE PHY Selection Criteria

- **Obtain and/or modify a physical layer (PHY) design that is separable from the MAC and supports variable bandwidths as described in the CBMANET program methodology**
  - **PHY and MAC open source code are needed to support modification,**

  PHY OPNET model development, and PHY evaluation.
- **Use for both** Baseline **and** Contractor **testing**
  - **Define a PHY/MAC physical interface and API that supports integration of the PHY radio to the contractor and baseline protocol stacks**
  - **Requires Baseline MAC that interfaces with the PHY**
- **Supply a PHY radio for lab and field tests consisting of RF, IF, and hardware for PHY processing**
- **Obtain a feature-rich and flexible PHY design with open PHY-MAC API that provides evolution for the life of the program**

GFE PHY Layer (Waveform) Criteria

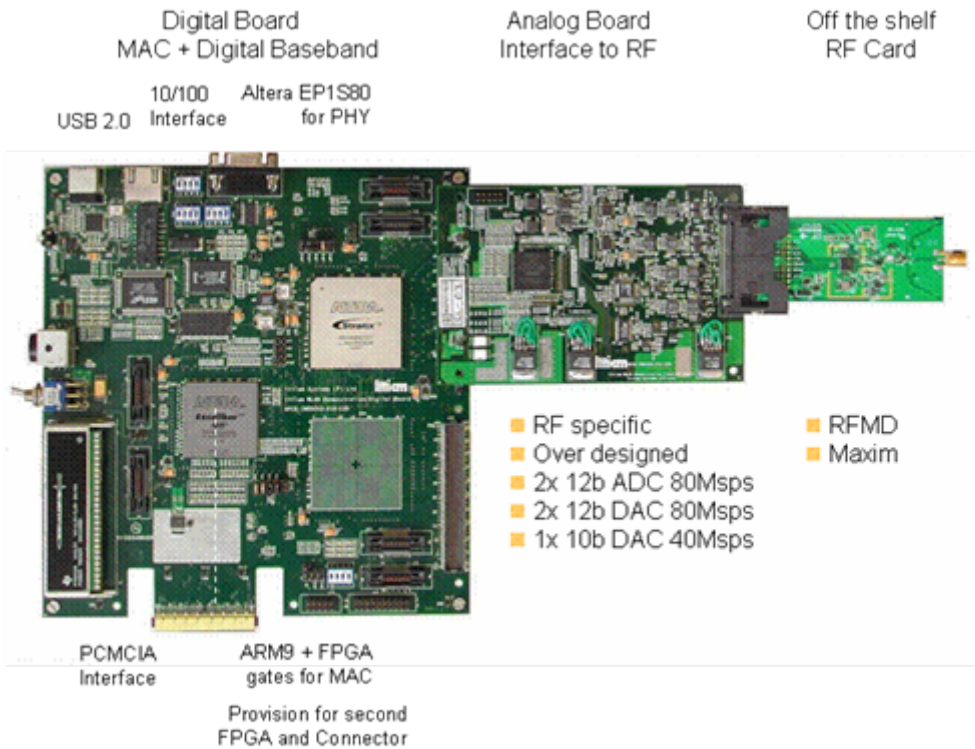
- Operation in mobile environment required
- Highly desired features available at API:
  - Selectable data rates
  - Power Control
  - Receive Signal Strength Indicator (RSSI)
  - Flexibility to add Critical Sensors/Controls not currently identified
- IEEE 802.11g is current leading candidate
  - Variable bandwidth up to 20 MHz to support CBMANET methodology
  - PHY needs to be separable from MAC
  - Nominal data rates (single link) of at least 2 MBps

GFE PHY Radio (hardware) Criteria

- Fully tested PHY radio board
  - Hardware capable of hosting PHY layer
  - Provides complete RF/IF solution for 2.4 GHz ISM band
- Supports PHY-MAC API and hardware interface
- 5 Watts of average power
- Omni-directional antenna
- Open design for government purposes of supporting PHY evolution or cost reduction
- Quantity (estimate) of 36 units per performer

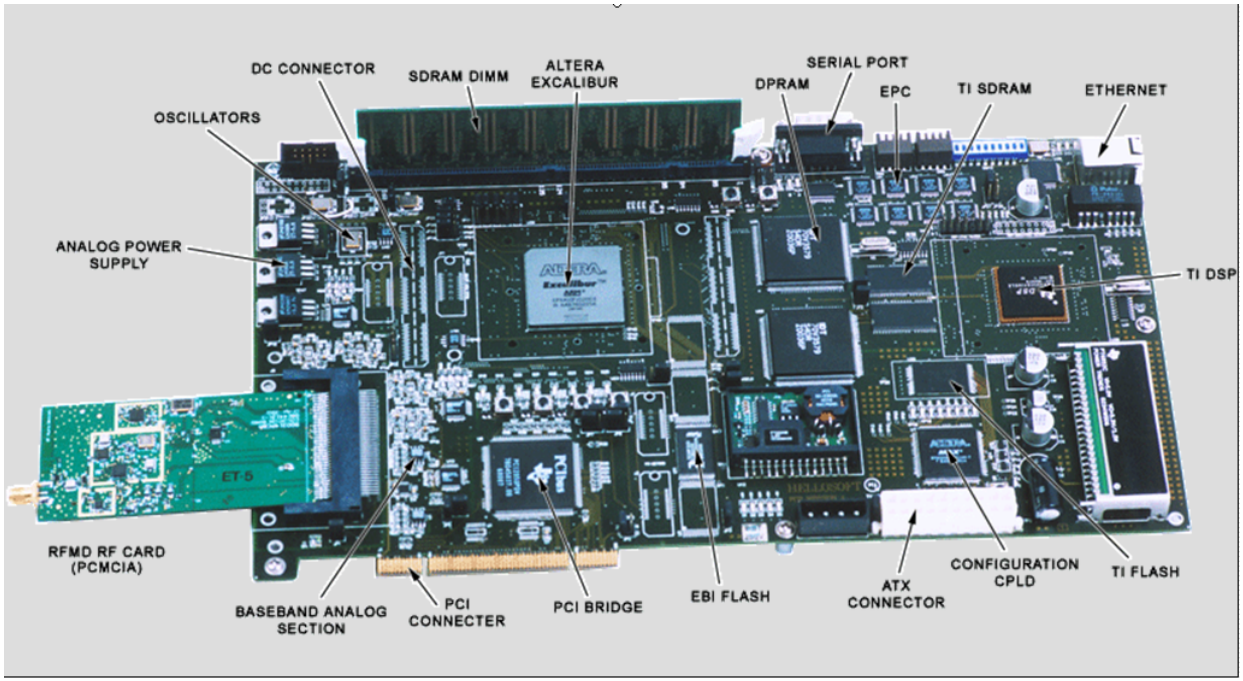
Potential GFE Candidate #1

- **Ittiam**
  - **802.11g PHY and MAC source code is available for purchase**
  - **WLAN Evaluation Platform is available for purchase**



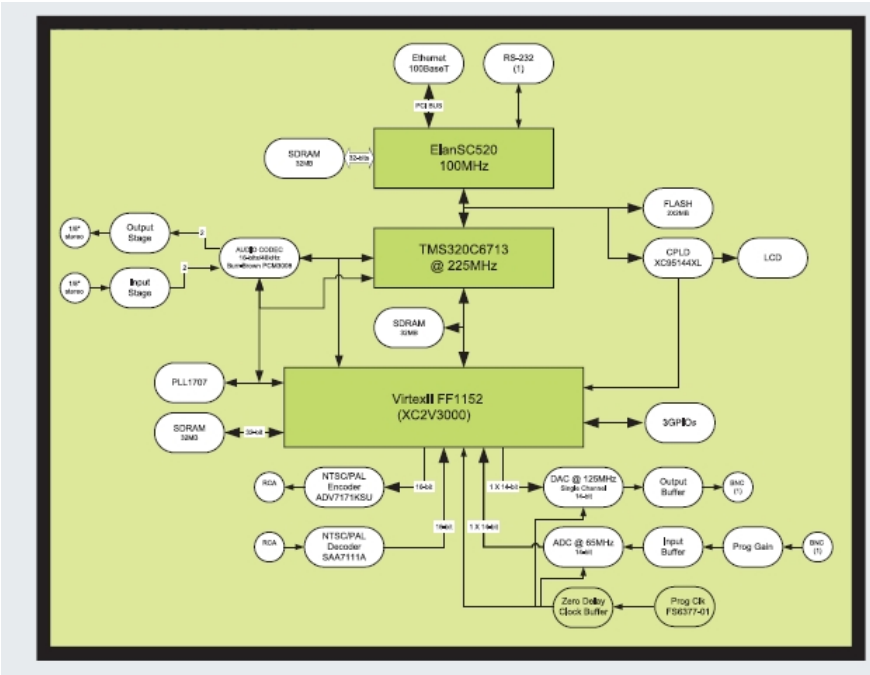
Potential GFE Candidate #2

- **HelloSoft**
  - **802.11g PHY and MAC source code is available for purchase**
  - **WLAN Evaluation Platform is available for purchase**



Potential GFE Candidate #3

- **Lyrtech SignalWave baseband processing board using Maxim RF**



Remaining Issues

- Best approach to achieve DARPA's request for variable bandwidth is TBD
- Best approach to acquire required quantity (nominally 36 per performer) is TBD
- 802.11g includes DSSS or OFDM
  - OFDM better for bandwidth adjustment
  - PA backoff requirement for OFDM

Bottom Line

- **3 Months:** Gov't will specify a common PHY and such interfaces that accommodate performer ideas to the extent deemed reasonable

- **14 Months**: Gov't will provide specifications of the Phase 2 hardware-based PHY

- **18 Months**: Gov't will give performers access to limited quantities of the Phase 2 PHY board for development purposes. Additional quantities to be provided in advance of scheduled lab tests, and again in advance of the field test.